

TITLE OF THE INVENTION

• SERVER/CLIENT SYSTEM AND PROGRAM FOR IMPLEMENTING
APPLICATION DISTRIBUTION IN THIS SERVER/CLIENT SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2000-196865, filed June 29, 2000, the entire contents of which are incorporated herein by reference.

10 BACKGROUND OF THE INVENTION

The present invention relates to a server/client system and a program for implementing application distribution in this server/client system.

15 For example, applications used for mobile terminals and portable telephones are stored in a ROM of the product prior to shipment. Most of these applications cannot be rewritten or added to. As the data communication infrastructure develops, however, there have become available a mobile terminal and a
20 portable telephone which contain a browser and mail applications for providing a capability of data communication as a stand-alone terminal. Further, it is expected that the mobile terminal or portable telephone be used like a networked PC in such a way
25 that an application is executed by downloading it from the network. Unlike PC platforms, however, there are varieties of platforms for mobile terminals and

portable telephones. There is a problem that an application's executable objects need to be provided for respective platforms independently.

As a technology for solving this problem, 5 particular attention is paid to a simple virtual computer environment oriented to mobile terminals and portable telephones. The most typical virtual computer environment is Java. The application execution environment for Java signifies executing a platform-independent executable object called a bytecode in the 10 virtual computer environment called Java VM (virtual machine) developed for a specific platform. A bytecode is generated by compiling a source code in Java. When platforms are provided with Java VMs which execute the 15 bytecode, it is possible to provide an environment in which any platform can execute the same application written in Java. For example, Jpn. Pat. Appln. KOKAI Publication No. 11-187470 discloses such an environment.

20 In the case of mobile terminals and portable telephones, platform functions for operating virtual computers depend on communication agencies and terminal manufacturers. For this reason, it is not possible to fully standardize application interfaces (including 25 a communication capability and device functions such as a keyboard and a display) characteristic of the virtual computer environment. As a result, there arises

a problem of distributing different executable objects in the virtual computer environment for mobile terminals and portable telephones according to communication agencies and terminal manufacturers.

5 There is a possibility of not making the most of virtual computer features.

A possible solution for this problem is to generate an executable object including all necessary components and processing so that an application can execute in virtual computer environments for different platforms. On the contrary, however, this causes a problem of increasing the executable object size.

Compared to a LAN or dedicated line connection, the communication environment for mobile terminals and portable telephones provides a lower bandwidth for data communication and a smaller memory area for storing applications. Accordingly, the size of an object to be downloaded needs to be small. Although some effects can be expected by compressing an object during downloading or by optimizing the object size, the CPU throughput may not be sufficiently allocated to the processing.

Generally, download-based applications used for portable telephones are highly entertainment-oriented and are characterized by relatively short life cycles. Such an application may require an execution restriction capability for limiting the period or

the number of times for using the application. On PCs, there are generally adopted execution restriction methods. For example, a time limit for using the application is embedded in the application.

5 Further, an OS-provided application parameter storage area stores the number of executions or the time limit of the application. Associated data is referenced and updated each time the application is executed.

10 In portable telephones, however, communication agencies and terminal manufacturers employ different interface specifications for the application parameter storage area. There may be the case where the memory area is not allocated sufficiently. Accordingly, the execution restriction capability for portable 15 telephones needs to be available independently of platforms for the communication agencies and terminal manufacturers.

20 As mentioned above with respect to the prior art, mobile terminals and portable telephones are provided with virtual computer environments whose application interfaces partially differ depending on communication agencies and terminal manufacturers. There has been a problem of providing each platform with a specific executable object or distributing a large-size 25 executable object containing functions oriented to different platforms.

BRIEF SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a server/client system capable of distributing applications to terminals without increasing the object size and to provide a program for implementing the application distribution in this server/client system.

To attain the aforementioned object, a system according to a first aspect of the present invention, using a server to distribute an application to a client via a network, wherein a client transmits to the server a request to download an application including a platform type for the client and stores the application transmitted from the server in an application storage area;

the server comprising:
an application storage section comprising a
prepared module group and a link information table
storing link information for linking these modules as
executable objects for respective platforms:

a download request acceptance section configured to accept a request to download the application from the client;

25 an application generation section configured to determine the platform type included in a download request accepted by the download request acceptance section, reference the link information table, and

generate an executable object for the application; and
an application transmission section configured to
transmit the executable object generated by the
application generation section to the client.

5 A system according to a second aspect of the
present invention, using a server to distribute an
application to a client via a network wherein a client
transmits to the server a request to download an
application and stores the application transmitted from
10 the server in an application storage area;
 the server comprising:
 an application storage section comprising a
prepared module group and a link information table
storing link information for linking these modules as
15 executable objects for respective platforms;
 a download request acceptance section configured
to accept a request to download the application from
the client;
 an application generation section configured to
20 determine a type of the platform based on a network
address of the client, reference the link information
table, and generate an executable object for the
application; and
 an application transmission section configured to
25 transmit the executable object generated by the
application generation section to the client.

A system according to a third aspect of the

present invention, using a server to distribute an application to a client via a network, wherein the client transmits to the server a request to download an application via a relay server and stores the 5 application transmitted from the server in an application storage area;

the server comprising:

10 an application storage section comprising a prepared module group and a link information table storing link information for linking these modules as executable objects for respective platforms;

a download request acceptance section configured to accept a request to download the application from the client;

15 an application generation section configured to determine a type of the platform based on a network address of the relay server, reference the link information table, and generate an executable object for the application; and

20 an application transmission section configured to transmit the executable object generated by the application generation section to the client.

A system according to a fourth aspect of the present invention, using a server to distribute an application to a client via a network, wherein the 25 client transmits to the server a request to download an application and stores the application transmitted

from the server in an application storage area;

the server comprising:

an application storage section comprising a prepared module group and a link information table

storing link information for linking these modules as executable objects for respective platforms;

a download request acceptance section having

a plurality of port addresses configured to accept a request to download the application from the client;

an application generation section configured to determine a type of the platform based on a port address having accepted the download request reference the link information table and generate an executable object for the application; and

an application transmission section configured to transmit the executable object generated by the application generation section to the client.

A system according to a fifth aspect of the present invention, using a server to distribute an application to a client via a network wherein the client transmits to the server a request to download an application including a platform type for the client and stores the application transmitted from the server in an application storage area and the application comprises a first module group executed on the client and a second module group executed on the server in place of the client;

On the 26th of October, 1859, the author, with his wife and two sons, left New York for Europe, and, after a sojourn of nearly two years, returned to New York on the 26th of October, 1861.

the server comprising:

an application storage section comprising the
first and second module groups and a link information
table storing link information configured to link these
5 modules as executable objects for respective platforms;

a download request acceptance section configured
to accept a request to download an application from the
client;

10 an application generation section configured to
determine the platform type included in a download
request accepted by the download request acceptance
section, reference the link information table and
generate an executable object for the application;

15 an application transmission section configured to
transmit the executable object generated by the
application generation section to the client; and

20 a substitutive execution section configured to
accept a processing request from the second module
group executed on the server in place of the client
during execution of an application on the client and
transmit a substitutive execution result to the client.

25 A system according to a sixth aspect of the
present invention, using a server to distribute an
application to a client via a network wherein the
client transmits to the server a request to download an
application and stores the application transmitted from
the server in an application storage area and the

application comprises a first module group executed on the client and a second module group executed on the server in place of the client;

the server comprising:

5 an application storage section comprising the first and second module groups and a link information table storing link information for linking these modules as executable objects for respective platforms;

10 a download request acceptance section configured to accept a request to download an application from the client;

15 an application generation section configured to determine a type of the platform based on a network address of the client, reference the link information table, and generate an executable object for the application;

an application transmission section configured to transmit the executable object generated by the application generation section to the client; and

20 a substitutive execution section configured to accept a processing request from the second module group executed on the server in place of the client during execution of an application on the client and sending a substitutive execution result to the client.

25 A system according to a seventh aspect of the present invention, using a server to distribute an application to a client via a network wherein the

client transmits to the server a request to download an application via a relay server and stores the application transmitted from the server in an application storage area and the application comprises 5 a first module group executed on the client and a second module group executed on the server in place of the client;

the server comprising:

10 an application storage section comprising the first and second module groups and a link information table storing link information for linking these modules as executable objects for respective platforms;

15 a download request acceptance section configured to accept a request to download an application from the client;

an application generation section configured to determine a type of the platform based on a network address of the relay server, referencing the link information table, and generating an executable object 20 for the application;

an application transmission section configured to transmit the executable object generated by the application generation section to the client; and

25 a substitutive execution section configured to accept a processing request from the second module group executed on the server in place of the client during execution of an application on the client and

transmit a substitutive execution result to the client.

A system according to an eighth aspect of the present invention, using a server to distribute an application to a client via a network wherein the client transmits to the server a request to download an application and stores the application transmitted from the server in an application storage area the application comprises a first module group executed on the client and a second module group executed on the server in place of the client;

the server comprising:

an application storage section comprising the first and second module groups and a link information table storing link information for linking these modules as executable objects for respective platforms;

a download request acceptance section having a plurality of port addresses configured to accept a request to download an application from the client;

20 an application generation section configured to determine a type of the platform based on a port address having accepted the download request, reference the link information table and generate an executable object for the application;

25 an application transmission section configured to transmit the executable object generated by the application generation section to the client; and a substitutive execution section configured to

accept a processing request from the second module group executed on the server in place of the client during execution of an application on the client and transmit a substitutive execution result to the client.

5 A system according to a ninth aspect of the present invention, using a server to distribute an application to a client via a network wherein the client transmits to the server a download request including a function request of the application and
10 stores the application transmitted from the server in an application storage area the application comprises a module group including modules having the same module interface and different functions;

15 the server comprising:
 an application storage section comprising the module group and a link information table for linking these modules as executable objects compliant with an application function request from the client;

20 a download request acceptance section configured to accept a request to download the application from the client;

25 an application generation section configured to determine the application function request included in a download request accepted by the download request acceptance section, reference the link information table and generate an executable object for the application;

an application transmission section configured to transmit the executable object generated by the application generation section to a client.

5 A program according to a tenth aspect of the present invention for a computer to implement a function by which a client transmits to a server a request to download an application including a platform type for the client via a network and stores the application transmitted from the server in an application storage area, the function including:

a download request acceptance function configured to accept a request to download the application from the client;

15 an application generation function configured to determine the platform type included in an accepted download request, reference a link information table storing link information for linking a prepared module group as an executable object for each platform, and generate an executable object for the application; and

20 an application transmission function configured to
transmit the generated executable object to the client.

A program according to an eleventh aspect of the present invention for a computer to implement a function by which a client transmits to a server a request to download an application via a network and stores the application transmitted from the server in an application storage area, the function including:

- a download request acceptance function configured
 - to accept a request to download the application from the client;

an application generation function configured to
5 determine a type of the platform based on a network
address of the client, reference a link information
table storing link information for linking a prepared
table storing link information for linking a prepared
module group as an executable object for each platform,
and generate an executable object for the application;
10 and

an application transmission function configured to transmit the generated executable object to the client.

15 A program according to a twelfth aspect of the present invention for a computer to implement a function by which a client transmits to a server a request to download an application via a relay server and stores the application transmitted from the server in an application storage area, the function including:

20 a download request acceptance function configured
to accept a request to download the application from
the client;

an application generation function configured to
determine a type of the platform based on a network
address of the relay server, reference a link
information table storing link information for linking
a prepared module group as an executable object for
each platform, and generate an executable object for

the application; and

an application transmission function configured to transmit a generated executable object to the client.

A program according to a thirteenth aspect of
5 the present invention for a computer to implement a function by which a client transmits to a server a request to download an application via a network and stores the application transmitted from the server in an application storage area, the function including:

10 a download request acceptance function configured to accept a request to download the application from the client;

an application generation function configured to determine a type of the platform based on a port
15 address having accepted the download request, reference a link information table storing link information for linking a prepared module group as an executable object for each platform, and generate an executable object for the application; and

20 an application transmission function configured to transmit the generated executable object to the client.

A program according to a fourteenth aspect of
the present invention for a computer to implement a
function by which a client transmits to a server a
25 request to download an application including a platform type for the client and stores the application transmitted from the server in an application storage

area, wherein

the application comprises a first module group executed on the client and a second module group executed on the server in place of the client; and

5 the function including:

a download request acceptance function configured to accept a request to download an application from the client;

10 an application generation function configured to determine the platform type included in an accepted download request, reference a link information table storing link information for linking the first and second module groups as executable objects for each platform, and generate an executable object for the application;

15 an application transmission function configured to transmit the generated executable object to the client; and

20 a substitutive execution function configured to accept a processing request from the second module group executed on the server in place of the client during execution of an application on the client and transmit a substitutive execution result to the client.

25 A program according to a fifteenth aspect of the present invention for a computer to implement a function by which a client transmits to a server a request to download an application and stores

the application transmitted from the server in
an application storage area, wherein

the application comprises a first module group
executed on the client and a second module group
executed on the server in place of the client; and
5 the function including:

a download request acceptance function configured
to accept a request to download an application from the
client;

10 an application generation function configured to
determine a type of the platform based on a network
address of the client, reference a link information
table storing link information for linking the first
and second module groups as executable objects for each
15 platform, and generate an executable object for the
application;

an application transmission function configured to
transmit the generated executable object to the client;
and

20 a substitutive execution function configured to
accept a processing request from the second module
group executed on the server in place of the client
during execution of an application on the client and
transmit a substitutive execution result to the client.

25 A program according to a sixteenth aspect of
the present invention for a computer to implement a
function by which a client transmits to a server a

request to download an application via a relay server and stores the application transmitted from the server in an application storage area, wherein

5 the application comprises a first module group executed on the client and a second module group executed on the server in place of the client; and the function including:

10 a download request acceptance function configured to accept a request to download an application from the client;

15 an application generation function configured to determine a type of the platform based on a network address of the relay server, reference a link information table storing link information for linking the first and second module groups as executable objects for each platform, and generate an executable object for the application;

20 an application transmission function configured to transmit the generated executable object to the client; and

25 a substitutive execution function configured to accept a processing request from the second module group executed on the server in place of the client during execution of an application on the client and transmit a substitutive execution result to the client.

A program according to a seventeenth aspect of the present invention for a computer to implement

a function by which a client transmits to a server
a request to download an application and stores
the application transmitted from the server in an
application storage area, wherein

5 the application comprises a first module group
executed on the client and a second module group
executed on the server in place of the client; and
 the function including:

10 a download request acceptance function configured
to accept a request to download an application from the
client by using a plurality of port addresses;

15 an application generation function configured to
determine a type of the platform based on a port
address having accepted the download request, reference
a link information table storing link information for
linking the first and second module groups as
executable objects for each platform, and generate an
executable object for the application;

20 an application transmission function configured to
transmit the generated executable object to the client;
and

25 a substitutive execution function configured to
accept a processing request from the second module
group executed on the server in place of the client
during execution of an application on the client and
transmit a substitutive execution result to the client.

A program according to an eighteenth aspect of

the present invention for a computer to implement
a function by which a client transmits to a server a
download request including a function request of the
application via a network and stores an application
5 sent from the server in an application storage area,
wherein

the application comprises a module group including
modules having the same module interface and different
functions; and

10 the function comprising:

a download request acceptance function configured
to accept a request to download the application from
the client;

15 an application generation function configured to
determine an application function request included in
an accepted download request, reference the link
information table, and generate an executable object
for the application; and

20 an application transmission function configured to
transmit the generated executable object to a client.

Additional objects and advantages of the invention
will be set forth in the description which follows, and
in part will be obvious from the description, or may
be learned by practice of the invention. The objects
25 and advantages of the invention may be realized and
obtained by means of the instrumentalities and combina-
tions particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate presently embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

FIG. 1 shows a configuration of a server/client system according to a first embodiment of the present invention;

FIG. 2 shows a configuration of an application download server S1 in FIG. 1;

FIG. 3 shows states of an application link information table LTA1 and an application class storage section CLA1 when an application "A" is stored in an application storage section HD1;

FIG. 4 shows a configuration of an executable object OA1 generated in the first embodiment;

FIG. 5 shows a configuration of an executable object OA2 generated in the first embodiment;

FIG. 6 shows a configuration of a server/client system according to a second embodiment of the present invention;

FIG. 7 shows states of an application storage section HD1 corresponding to the second embodiment of the present invention;

FIG. 8 shows a configuration of an application execution management server M1;

FIG. 9 shows a configuration of an executable object OB1 generated in the second embodiment; and

5 FIG. 10 shows a configuration of an executable object OB2 generated in the second embodiment.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will be described in further detail with reference to the accompanying drawings.

(First Embodiment)

FIG. 1 shows a configuration of a server/client system according to a first embodiment of the present invention. The system comprises portable telephones MS1 and MS2, a base station BS1, a wireless network WN1, a network CN1 such as a communication agency network or Internet, and an application download server S1 connected to the network CN1.

20 The portable telephones MS1 and MS2 work as clients and are provided with the virtual computer environment such as Java VM. These portable telephones can download an executable object for the virtual computer from the application download server S1, via the base station BS1 and the wireless network WN1, and 25 execute the downloaded executable object in the terminal. The portable telephone MS1 is capable of color display. The portable telephone MS2 is designed

for monochrome display, not capable of color display.

This embodiment distributes a same application "A" to these two types of portable telephones according to a method to be described later.

5 FIG. 2 shows a configuration of the application
download server S1 in FIG. 1. The server comprises
an application request acceptance section FR1,
an application generation section FL1, an application
transmission section FS1, and an application storage
section HD1. Further, the application storage section
HD1 comprises an application link information table LT1
10 and an application class storage section CL1.

The application "A" described in this embodiment becomes an executable object by linking three classes CA, CB, and CC. Of these three classes, class CC is responsible for the application's display function. More specifically, there are provided class CC1 for color display terminals and class CC2 for monochrome display terminals. When an application is generated, class CC1 or CC2 is linked to executable object as class CC.

FIG. 3 shows states of the application link information table LTA1 and the application class storage section CLA1 when the application "A" is stored in the application storage section HD1. The application link information table LTA1 includes a class constituting the application, a table describing

terminal-dependent information for that class, and
a table describing which class is to be linked for each
terminal type with respect to a terminal-dependent
class. The application class storage section CLA1
5 stores a class group to be linked. This embodiment
uses the class group as one of the module groups but is
not limited thereto. It may be preferable to use
a function group in the C language.

10 The following describes a flow of processing in
which the application "A" is downloaded to the portable
telephone MS1 based on the thus configured application
storage section HD1.

15 1. The portable telephone MS1 issues a request
for downloading the application "A" to the application
download server S1. At this time, the download request
is provided with terminal type information (MS1) as one
part of platform type information. The platform type
information further includes agency names and the like.

20 2. The application request acceptance section FR1
accepts the request for downloading the application "A"
from the portable telephone MS1 and issues a request
for generating the terminal type information MS1 and
the application "A" to the application generation
section FL1.

25 3. The application generation section FL1
references the application link information table LTA1
in the application storage section HD1. The

application generation section FL1 then links classes CA, CB, and CC1 to generate an executable object OA1. At this time, class CC1 corresponds to class CC executable on the portable telephone MS1 for color 5 display. The executable object OA1 is passed to the application transmission section FS1.

4. The application transmission section FS1 sends the executable object OA1 to the portable telephone MS1.

10 Also for the portable telephone MS2, classes CA, CB, and CC2 are linked for sending an executable object OA2 in the same manner as mentioned above. FIGS. 4 and 5 show configurations of the executable objects OA1 and OA2 generated in this embodiment, respectively.

15 According to the conventional technique, executable objects are generated for portable telephones MS1 and MS2 in advance and are selected when the application is downloaded. Alternatively, an application including both classes CC1 and CC2 is 20 distributed. At execution time, the terminal determines the terminal type and calls an appropriate class. The method according to this embodiment eliminates the need for generating an executable object in advance and decreases the size of the executable 25 object to be downloaded, making it possible to improve the download efficiency.

Generally in the case of portable telephones,

communication agencies individually specify user interface specifications as terminal specifications. Accordingly, the user interface for the virtual computer environment may also depend on communication agencies. In this case, an application download server on the Internet can use the application download system according to the following method.

For example, it is assumed that communication agency types can be identified by network addresses for the portable telephones MS1 and MS2 or by a network address of a relay server installed between the portable telephone MS1 or MS2 and the application download server S1. The corresponding network address is used for determining the terminal type and referencing the application link information table LT1. In this case, the terminal type information in the application link information table LT1 is replaced by a communication agency type. Alternatively, type information about the communication agency is added to the terminal type information for use.

It may be preferable to use yet another method. Namely, the download request acceptance section FR1 uses a plurality of port addresses to accept a download request from the portable telephone MS1. The application generation section FL1 determines the terminal type based on the port address for accepting the relevant download request.

(Second Embodiment)

FIG. 6 shows a configuration of a server/client system according to the second embodiment of the present invention. The system comprises portable 5 telephones MS3 and MS4, a base station BS1, a wireless network WN1, a network CN1 such as a communication agency network or the Internet, an application download server S1 and an application execution management server M1 connected to the network CN1. The portable 10 telephones MS3 and MS4 are provided with the virtual computer environment. Via the base station BS1 and the wireless network WN1, these portable telephones can download an executable object for the virtual computer from the application download server S1 via the base 15 station BS1 and wireless network WN1, and execute the downloaded executable object in the terminals.

It is assumed that execution restrictions such as an execution time limit and the number of executions are given to an application "B" to be downloaded and 20 used for portable telephones in this embodiment. It is also assumed that a user of the portable telephone MS3 wants to use the application "B" by specifying the execution time limit. When the time limit expires, the application becomes unavailable. By contrast, a user 25 of the portable telephone MS4 wants to use the application "B" by specifying the number of executions.

The application "B" becomes an executable object

by linking three classes CD, CE, and CF. Of these three classes, class CF is responsible for the application's execution control function. More specifically, there are provided class CF1 for enabling the execution restriction based on the time limit and class CF2 for enabling the execution restriction based on the number of executions. When an application is generated, class CF1 or CF2 is linked to class CF according to a user's request for the function.

10 Class CF1 is executed independently in the terminal. Class CF2 manages the number of executions by inquiring of the application execution management server M1 to be described later.

15 FIG. 7 shows states of the application storage section HD1 corresponding to the second embodiment of the present invention. The basic configuration is the same as that for the first embodiment. The application storage section HD1 here configures a link information table according to function types.

20 As shown in FIG. 8, the application execution management server M1 comprises an application execution management section FC1, an application management registration section FD1, and an application execution management table CT1. When downloading the application, the server decrements a counter specified for each application in response to a request from class CF2 during application execution.

The following describes a flow of processing in which the application "B" is downloaded to the portable telephone MS3 based on the above-mentioned configuration.

- 5 1. The portable telephone MS3 issues a request for downloading the application "B" to the application download server S1. At this time, the request is provided with the time limit specification information as the application's function information.
- 10 2. The application request acceptance section FR1 accepts the request for downloading the application "B" from the portable telephone MS3 and issues a request for generating the application "B" with the time limit specified to the application generation section FL1.
- 15 3. The application generation section FL1 references the application link information table LTB1 in the application storage section HD1. The application generation section FL1 then links classes CD, CE, and CF1 to generate an executable object OB1.
- 20 At this time, class CF1 corresponds to class CF for applying the execution restriction with the time limit specified. The executable object OB1 is passed to the application transmission section FS1.
- 25 4. The application transmission section FS1 sends the executable object OB1 to the portable telephone MS3.

The following describes a flow of processing in

which the application "B" is downloaded to the portable telephone MS4.

1. The portable telephone MS3 issues a request for downloading the application "B" to the application download server S1. At this time, the download request is provided with the count specifying information as the application's function information.

2. The application request acceptance section FR1 accepts the request for downloading the application "B" from the portable telephone MS4 and issues a request for generating the application "B" with 7 times specified to the application generation section FL1.

3. The application generation section FL1 references the application link information table LTB1 in the application storage section HD1. The application generation section FL1 then links classes CD, CE, and CF2 to generate an executable object OB2. At this time, class CF2 corresponds to class CF for applying the execution restriction with the number of times specified. The executable object OB2 is passed to the application transmission section FS1.

4. The application transmission section FS1 sends the executable object OB2 to the portable telephone MS4. It also sends the terminal ID, the application ID, and an initial value for the number of executions to the application management registration section FD1 on the application execution management server M1.

5. The application management registration section FD1 stores the terminal ID, the application ID, and the initial value for the number of executions in the application execution management table CT1.

5 FIGS. 9 and 10 show configurations of the executable objects OB1 and OB2 generated in this embodiment, respectively.

10 The terminal ID and the application ID registered here are information for specifying an application executed by the user. This information can be any ID for other purposes. For example, the terminal ID can be a telephone number or a user ID. The application ID can be an application name or a number unique to the site.

15 According to the above-mentioned processing, the portable telephone MS4 downloads the application "B" which restricts the number of executions. The following describes operations when this application is executed.

20 1. The portable telephone MS4 stores the application "B". The application's class CF issues a decrement request as well as the terminal ID and the application ID to the application execution management section FC1 on the application execution management server M1.

25 2. When detecting an entry for the application "B" on the MS4, the application execution management

section FC1 decrements the counter and returns a response indicating that the execution is possible. When no entry is detected, the application execution management section FC1 returns a response indicating that the execution is impossible. When an entry is available and the decrement results in 0, the application execution management section FC1 removes the entry for the application "B" on the MS4 from the application execution management table CT1.

3. When the application execution management section FC1 returns a response indicating that the execution is possible, the portable telephone MS4 continues executing the application. When the application execution management section FC1 returns a response indicating that the execution is impossible, the portable telephone MS4 terminates the application.

The above-mentioned embodiment describes how the present invention is applied when an application is provided with execution restrictions. This embodiment is also effective when an application with the charging function is distributed from a download server on the Internet. Generally, the charging portion depends on communication agencies. Especially, a server responsible for charging is installed in the communication agency network. In this case, the application download server specifies a communication agency according to the type or network address of the

portable telephone which issued a download request. The application download server then distributes an application which links classes for the charging section in each communication agency to the portable 5 telephone.

As mentioned above, this embodiment links and generates an application corresponding to a function request from the user during a download operation. Consequently, it is possible to provide highly 10 maintainable application distribution without increasing the executable object size for the application.

This embodiment of the present invention generates and sends an executable object which links only an 15 appropriate module to the client having different application interfaces when a download request occurs. The embodiment eliminates the need for generating an executable object to be distributed for respective client types and decreases the object size, effectively 20 downloading and storing an application in the client.

According to another embodiment of the present invention, the server can determine the platform type based on an address of the origin for sending a request to download an application, and then generate and send 25 the application. This address can be a network address for the client or the relay server. Even if the client cannot send a platform type to the server, it is

possible to effectively download and store an application in the client.

According to still another embodiment of the present invention, the server can determine the 5 platform type based on a port address of the destination for sending a request to download an application, and then generate and send the application. Even if the client cannot send a terminal type to the server, it is possible to effectively 10 download and store an application in the client.

When the client provides low throughput, yet another embodiment of the present invention can generate and distribute an application which allows the server to execute a relevant module. It is possible to 15 provide impartial services to client users with different throughputs.

According to still yet another embodiment of the present invention, the server can specify a substitutive execution module based on an address of 20 the origin for sending a request to download an application. It is possible to generate and send an object which allows different servers to be substitutively executed for clients and platforms.

According to yet still another embodiment of 25 the present invention, the server can specify a substitutive execution module based on a port address of the destination for sending a request to download

an application. It is possible to generate and send an object which allows different servers to be substitutively executed for clients and platforms.

Finally, still yet another embodiment of the 5 present invention can accept an application function request from the user and download an executable object comprising a module replaced by that function. This eliminates the need for generating a plurality of executable objects in advance and decreases the object 10 size, effectively downloading and storing an application in the client.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to 15 the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.